

# PATENT ABSTRACTS OF JAPAN

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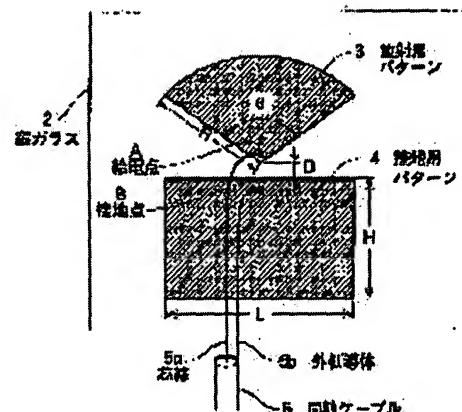
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## (54) GLASS ANTENNA SYSTEM FOR MOBILE TELEPHONE SET

### (57)Abstract:

**PURPOSE:** To provide a small sized glass antenna system for mobile telephone set with high sensitivity that receives a radio wave of two UHF bands in an excellent way.

**CONSTITUTION:** A perpendicular from a feeding point A is used for a symmetrical axis, and a projection being upwards having a prescribed angle  $\theta/2$  around the symmetrical axis is formed with two line segments R with a prescribed length extended upward in the vicinity of the feeding point and with a line segment of an optional shape connecting tips of the two line segments. Then a planar radiation pattern 3 and a rectangular grounding pattern 4 having two sides H, L of prescribed lengths are formed symmetrically on a window pane 2 with respect to the symmetrical axis.



### LEGAL STATUS

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the glass antenna equipment for car telephones which is formed in the windowpane of an automobile, and transmits and receives in a UHF band, and relates to the glass antenna equipment for car telephones from which good sensitivity is obtained with one antenna in a frequency band (800MHz and 1.5GHz) especially.

[0002]

[Description of the Prior Art] As these people indicated in the real extraction-of-the-square-root No. 82113 [ five to ] official report, the pattern for radiation consists of monopole configurations, and, as for the conventional glass antenna equipment for car telephones, the pattern for grounding consists of rectangle-like conductor patterns.

[0003] The block diagram of the conventional glass antenna equipment for car telephones is shown in drawing 9. In drawing 9, the glass antenna equipment 50 for car telephones is formed on a windowpane 51 by the pattern 52 for radiation whose length of the vertical direction is about 1 / four waves, and the pattern 53 for grounding whose length of a longitudinal direction the length of the vertical direction is about 1 / 4 - 3/4 wave in about 1 / four waves. core-wire 54a of a coaxial cable 54 (characteristic impedance of 50ohms) connects with the feeding point A of the pattern 52 for radiation -- having -- the grounding point B of the pattern 53 for grounding -- the outside of a coaxial cable 54 -- a conductor -- 54b is connected Thus, as for the glass antenna equipment 50 for car telephones of a monopole configuration, transceiver frequency is used for the constituted pattern 52 for radiation as an antenna of the car telephone equipment of a 800MHz band.

[0004] Drawing 10 is the directional-characteristics view of the conventional glass antenna equipment for car telephones. In drawing 10, directional characteristics with a frequency of 900MHz measured in the 800MHz band show an almost uniform value in all the directions, and a sensitivity difference is not seen.

[0005]

[Problem(s) to be Solved by the Invention] Although a 1.5GHz band is also increasingly used also for transceiver frequency along with the spread of car telephone equipment in addition to a 800MHz band, if the pattern for radiation applies the conventional glass antenna equipment for car telephones of a monopole configuration by the 1.5GHz frequency band, as shown in drawing 10, on the frequency of 1.5GHz, dispersion will be in directional characteristics and sufficient sensitivity will not be obtained.

[0006] 1. In order to acquire good sensitivity directional characteristics by the frequency band of 5 GHz, the glass antenna equipment for car telephones of the monopole configuration for 1.5GHz bands is independently needed. When it is going to transmit or receive the electric wave of a frequency band (800MHz and 1.5GHz) good, 2 sets, the number of the coaxial cables which connect the number of glass antennas to a transmitter-receiver, and the same number, are needed. Thus, when it is going to form the with a monopole configuration [ for frequency bands ] (800MHz and 1.5GHz) glass antenna equipment for car telephones on the windowpane of an automobile, the technical problem to which a latus mounting space is required, and the miniaturization of an antenna cannot be attained, and manufacture becomes complicated occurs. Therefore, glass antenna equipment for car telephones which has sensitivity directional characteristics even with a good frequency band (800MHz and 1.5GHz) is desired.

[0007] It was made in order that this invention might solve such a technical problem, and the purpose is in offering the glass antenna equipment for car telephones which can receive the electric wave of two frequency bands, 800MHz and 1.5GHz, good.

[0008]

[Means for Solving the Problem] The glass antenna equipment for car telephones applied to this invention in order to solve the aforementioned technical problem Set a symmetry axis as the perpendicular which passes the feeding point,

and it has this symmetry axis and a predetermined angle. Heights are formed up by the segment of the arbitrary configuration which connects between [ of two segments of the predetermined length prolonged in the upper part near the feeding point, and these two segments ] points. The pattern for radiation of a flat-surface configuration symmetrical with a symmetry axis, [0009] characterized by forming on a windowpane the pattern for grounding of the shape of a rectangle which has two sides of predetermined length Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the arc which makes the segment of predetermined length a radius, and is characterized by making the pattern for radiation into the shape of a sector. [0010] Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration in a straight line, and is characterized by making the pattern for radiation into the shape of an isosceles triangle.

[0011] Furthermore, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the polygonal line, and is characterized by making the pattern for radiation into the shape of a polygon symmetrical with a symmetry axis.

[0012] Moreover, the glass antenna equipment for car telephones concerning this invention is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, and is characterized by forming the pattern for radiation.

[0013] Furthermore, the glass antenna equipment for car telephones concerning this invention is characterized by having the impedance adjustment means formed by the conductor pattern near the feeding point of the pattern for radiation, and the grounding point of the pattern for grounding.

[0014]

[Function] The glass antenna equipment for car telephones concerning this invention Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined angle. Heights are formed up by the segment of the arbitrary configuration which connects between [ of two segments of the predetermined length prolonged in the upper part near the feeding point, and these two segments ] points. The pattern for radiation of a flat-surface configuration symmetrical with a symmetry axis, Since the pattern for grounding of the shape of a rectangle which has two sides of predetermined length was formed on the windowpane, the electric wave of a frequency band (800MHz and 1.5GHz) is receivable good with one glass antenna equipment for car telephones.

[0015] Moreover, since the glass antenna equipment for car telephones concerning this invention formed the segment of an arbitrary configuration by the arc which makes the segment of predetermined length a radius and made the pattern for radiation the shape of a sector, it is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0016] Moreover, since the glass antenna equipment for car telephones concerning this invention formed the segment of an arbitrary configuration in a straight line and made the pattern for radiation the shape of an isosceles triangle, it is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0017] Furthermore, since the glass antenna equipment for car telephones concerning this invention formed the segment of an arbitrary configuration by the polygonal line and made the pattern for radiation the shape of a polygon symmetrical with a symmetry axis, it is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0018] Moreover, the glass antenna equipment for car telephones concerning this invention is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, since it formed the pattern for radiation, is one glass antenna equipment for car telephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0019] Furthermore, since the glass antenna equipment for car telephones concerning this invention was equipped with the impedance adjustment means formed by the conductor pattern near the feeding point of the pattern for radiation, and the grounding point of the pattern for grounding, it can perform adjustment of the coaxial cable and impedance which are connected to the feeding point of the pattern for radiation, and the grounding point of the pattern for grounding, can cover the whole frequency band, and can raise sensitivity.

[0020]

[Example] Hereafter, the example of this invention is explained based on an accompanying drawing. Drawing 1 is the block diagram of the glass antenna equipment for car telephones concerning this invention. In drawing 1, the glass antenna equipment 1 for car telephones forms the pattern 3 for radiation of the shape of a sector which has a predetermined radius R and a predetermined angle theta, and the pattern 4 for grounding of the shape of a rectangle which has two sides of predetermined length on a windowpane 2 in Distance D. moreover, the feeding point A of the pattern 3 for radiation -- core-wire 5a of a coaxial cable 5 (characteristic impedance of 50ohms) -- connecting -- the

grounding point B of the pattern 4 for grounding -- the outside of a coaxial cable 5 -- a conductor -- 5b is connected [0021] With the radius R of the sector-like pattern 3 for radiation, and the value of an angle theta, the impedance and frequency band of glass antenna equipment are set up. When setting the impedance of a glass antenna as 50 ohms of abbreviation, the value of R and theta has the following desirable range (30 mm < R < 60mm, 80 degrees < theta < 140 degrees). Moreover, the distance D value of the pattern 3 for radiation and the pattern 4 for grounding has the following desirable range (2 mm < D < 10mm).

[0022] Many properties of explaining below the radius R of the sector-like pattern 3 for radiation 45mm, Length H of the vertical direction of the pattern 4 for grounding of the shape of 120 degrees and a rectangle for an angle theta 40mm, The distance D of 60mm, the pattern 3 for radiation, and the pattern 4 for grounding for length L of a longitudinal direction 5mm, The length of a coaxial cable 5 (characteristic impedance of 50ohms) was set as 2m, and the glass antenna equipment 1 for car telephones installed and measured with the degree of tilt angle of 30 degrees on the copper plate arranged horizontally supposing being prepared in windowpane top 2 toward which the front face of an automobile or the tooth back inclined.

[0023] Drawing 2 is the directional-characteristics view of the glass antenna equipment for car telephones concerning this invention. the property at the time of measuring by 900MHz and 1.5GHz in drawing 2 -- it is -- both frequency -- an omnidirectional simultaneously -- a uniform value is shown and good directional characteristics are acquired

[0024] Drawing 3 is a sensitivity frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention. In drawing 3, as compared with the conventional glass antenna equipment for car telephones, the glass antenna equipment for car telephones of this invention is level which is convenient practically, although average sensitivity is falling slightly by the whole frequency band.

[0025] Drawing 4 is a sensitivity frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention. In drawing 4, the glass antenna equipment for car telephones of this invention is level as compared with the conventional glass antenna equipment for car telephones, cover the whole frequency band, high average sensitivity and almost equivalent to the average sensitivity of the 800MHz band shown in drawing 3.

[0026] Drawing 5 is a voltage standing wave ratio frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention. A voltage standing wave ratio shows that adjustment of the impedance of an antenna and a coaxial cable can be taken, so that the value is small. In drawing 5, as compared with the conventional glass antenna equipment for car telephones, the glass antenna equipment for car telephones of this invention covers the whole frequency band, and shows an almost equivalent value.

[0027] Drawing 6 is a voltage standing wave ratio frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention. In drawing 6, the glass antenna equipment for car telephones of this invention has a small numeric value, and has taken adjustment of the impedance of an antenna and a coaxial cable.

[0028] Drawing 7 is another example block diagram of the glass antenna equipment for car telephones concerning this invention. In drawing 7, a point equipped with the impedance adjustment means 7 which formed the glass antenna equipment 6 for car telephones by the conductor pattern near the feeding point A of the pattern 3 for radiation and the grounding point B of the pattern 4 for grounding differs from the glass antenna equipment for car telephones of drawing 1. By having the impedance adjustment means 7, adjustment of an impedance with the coaxial cable 5 connected to the feeding point A of the pattern 3 for radiation and the grounding point B of the pattern 4 for grounding can be taken, the whole frequency band can be covered, and sensitivity can be raised.

[0029] Drawing 8 is another example block diagram at the pan of the glass antenna equipment for car telephones concerning this invention. As shown in drawing 8 (a), the glass antenna equipment 8 for car telephones may consist of isosceles triangle-like a pattern 9 for radiation, and rectangle-like a pattern 4 for grounding. Moreover, as shown in drawing 8 (b), the glass antenna equipment 10 for car telephones may constitute the pattern 11 for radiation which made the sector section extraction, and the rectangle section from a pattern for grounding made into extraction.

[0030] In addition, the pattern for radiation may make 120 degrees the angle theta of the pattern 3 for radiation of the shape of a sector shown in drawing 1, and may form it in the shape of a rhombus by one on the arc of the two sides and sector of a radius R.

[0031]

[Effect of the Invention] As explained above, the glass antenna equipment for car telephones concerning this invention Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined angle. Heights are formed up by the segment of the arbitrary configuration which connects between [ of two segments of the predetermined length prolonged in the upper part near the feeding point, and these two segments ] points. The pattern for radiation of a flat-surface configuration symmetrical with a symmetry axis, The pattern for

grounding of the shape of a rectangle which has two sides of predetermined length is formed on a windowpane, with one glass antenna equipment for car telephones Since the electric wave of a frequency band (800MHz and 1.5GHz) is receivable good, the mounting space efficiency of an antenna becomes good and a miniaturization can be attained.

[0032] Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the arc which makes the segment of predetermined length a radius, makes the pattern for radiation the shape of a sector, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0033] Moreover, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration in a straight line, makes the pattern for radiation the shape of an isosceles triangle, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0034] Furthermore, the glass antenna equipment for car telephones concerning this invention forms the segment of an arbitrary configuration by the polygonal line, makes the pattern for radiation the shape of a polygon symmetrical with a symmetry axis, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0035] Moreover, it is the pattern of the outside which extracted inside for the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, the glass antenna equipment for car telephones concerning this invention forms the pattern for radiation, is one glass antenna equipment for car telephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0036] Moreover, since the glass antenna equipment for car telephones concerning this invention is adjusted with the feeding point of the pattern for radiation, and the coaxial cable which was equipped with the impedance adjustment means formed by the conductor pattern near the grounding point of the pattern for grounding, and was connected to the feeding point and the grounding point, it can cover the whole frequency band and can realize high sensitivity.

[0037] Therefore, the glass antenna equipment for car telephones of high sensitivity can be offered by small [ which receives the electric wave of two frequency bands, 800MHz and 1.5GHz, good ].

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[Translation done.]

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**CLAIMS**

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**[Claim(s)]**

[Claim 1] Glass antenna equipment for car telephones which is characterized by providing the following and which used and formed the conductor pattern in the windowpane of an automobile. A symmetry axis is set as the perpendicular which passes the feeding point, it has this symmetry axis and a predetermined angle, heights are formed up by the segment of the arbitrary configuration which connects between [ of two segments of the predetermined length prolonged in the upper part near / aforementioned / the feeding point, and these two segments ] points, and it is the pattern for radiation of a flat-surface configuration symmetrical with the aforementioned symmetry axis. Two sides of predetermined length.

[Claim 2] Glass antenna equipment for car telephones according to claim 1 characterized by having formed the segment of the aforementioned arbitrary configuration by the arc which makes the segment of the aforementioned predetermined length a radius, and making the aforementioned pattern for radiation into the shape of a sector.

[Claim 3] Glass antenna equipment for car telephones according to claim 1 characterized by having formed the segment of the aforementioned arbitrary configuration in a straight line, and making the aforementioned pattern for radiation into the shape of an isosceles triangle.

[Claim 4] Glass antenna equipment for car telephones according to claim 1 characterized by having formed the segment of the aforementioned arbitrary configuration by the polygonal line, and making the aforementioned pattern for radiation into the shape of a polygon symmetrical with the aforementioned symmetry axis.

[Claim 5] The claim 2 characterized by forming the aforementioned pattern for radiation by the pattern of the outside which extracted inside for the shape of the shape of an aforementioned sector, and an isosceles triangle, and each multiple configuration by the analog of itself, a claim 3, and glass antenna equipment for car telephones according to claim 4.

[Claim 6] The claim 1 characterized by having the impedance adjustment means formed by the conductor pattern the feeding point of the aforementioned pattern for radiation, and near the grounding point of the aforementioned pattern for grounding, a claim 2, a claim 3, a claim 4, and glass antenna equipment for car telephones according to claim 5.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The block diagram of the glass antenna equipment for car telephones concerning this invention

[Drawing 2] The directional-characteristics view of the glass antenna equipment for car telephones concerning this invention

[Drawing 3] The sensitivity frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 4] The sensitivity frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 5] The voltage standing wave ratio frequency characteristic view in the 800MHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 6] The voltage standing wave ratio frequency characteristic view in the 1.5GHz band of the glass antenna equipment for car telephones concerning this invention

[Drawing 7] Another example block diagram of the glass antenna equipment for car telephones concerning this invention

[Drawing 8] The glass antenna equipment for car telephones concerning this invention is another example block diagram further.

[Drawing 9] The block diagram of the conventional glass antenna equipment for car telephones

[Drawing 10] The directional-characteristics view of the conventional glass antenna equipment for car telephones

[Description of Notations]

1, 6, 8, 10 [ -- An impedance adjustment means, 4, 12, 53 / -- 5 The pattern for grounding 54 / -- 2 A coaxial cable 51 / -- A windowpane, 50 / -- The conventional glass antenna equipment for car telephones. ] -- The glass antenna equipment for car telephones, 3, 9, 11, 52 -- The pattern for radiation, 7

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[Translation done.]

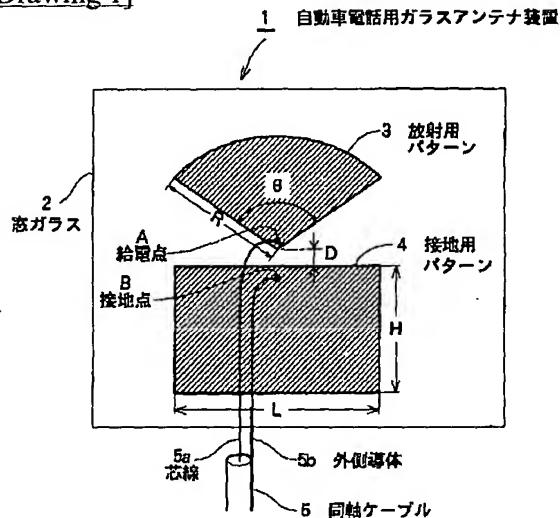
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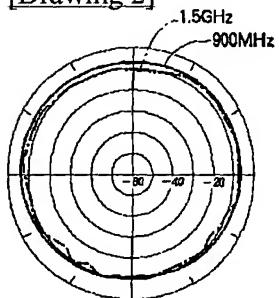
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## DRAWINGS

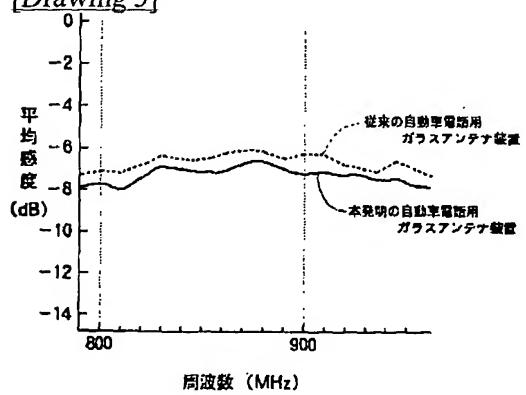
[Drawing 1]



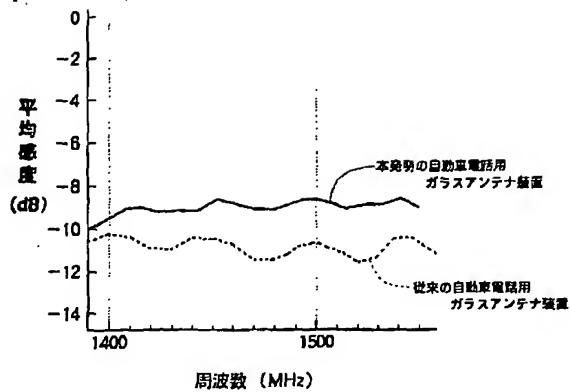
[Drawing 2]



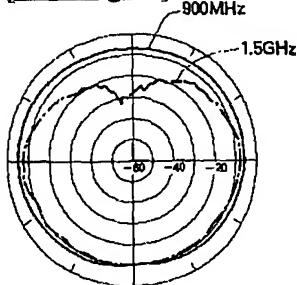
[Drawing 3]



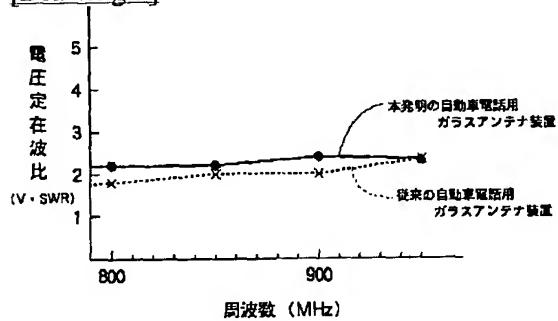
[Drawing 4]



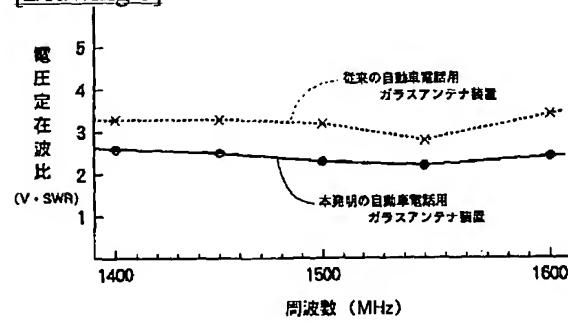
[Drawing 10]



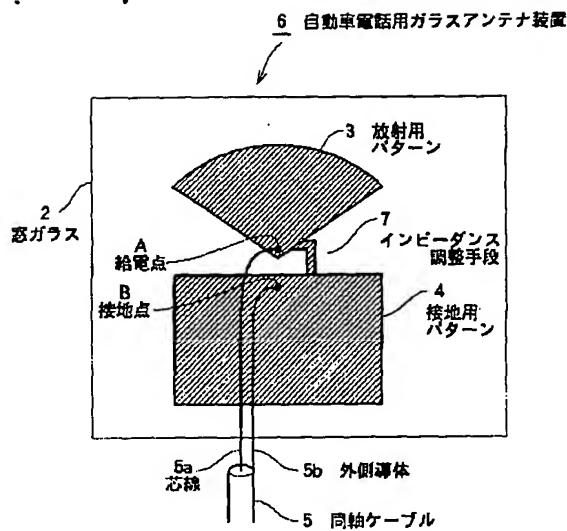
[Drawing 5]



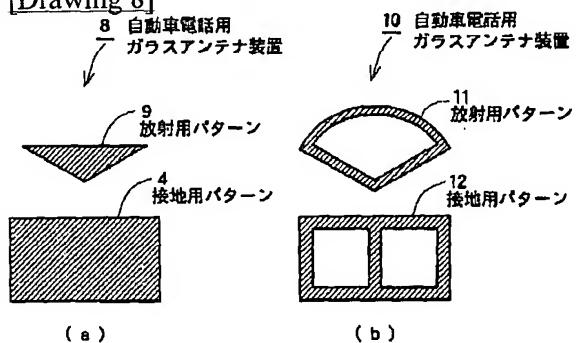
[Drawing 6]



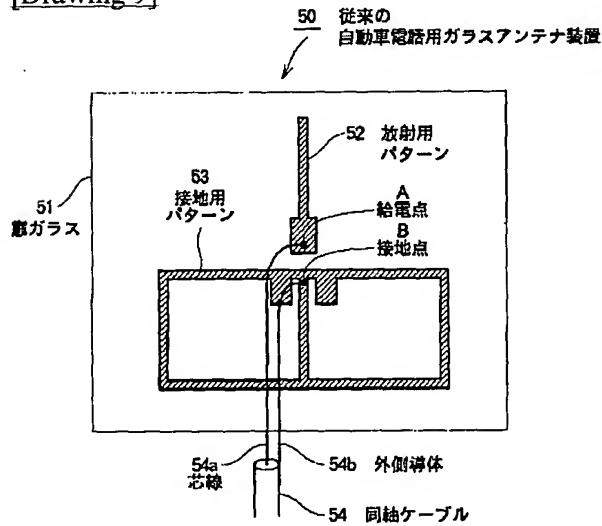
[Drawing 7]



[Drawing 8]



[Drawing 9]



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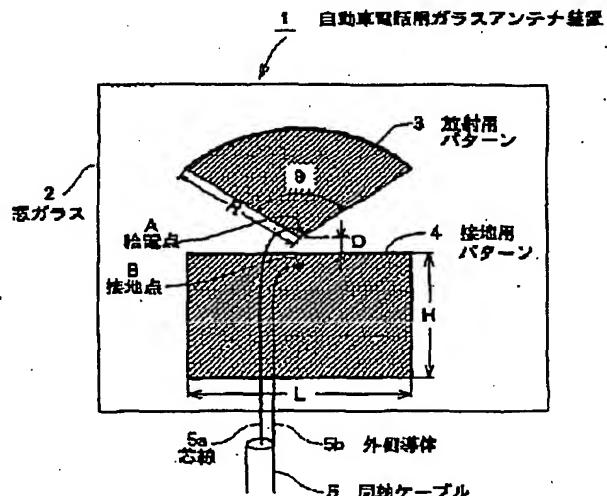
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(54) 【発明の名称】自動車電話用ガラスアンテナ装置

(57) 【要約】

【目的】 800MHzと1.5GHzの2つの周波数帯域の電波を良好に受信する小形で高感度の自動車電話用ガラスアンテナ装置を提供する。

【構成】 給電点Aを通過する垂線を対称軸とし、この対称軸と所定角度 $\theta/2$ を有し、給電点近傍から上方に延びる所定の長さRの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、対称軸に対称の平面形状の放射用パターン3と、所定の長さH、Lの2辺を有する矩形状の接地用パターン4とを窓ガラス2上に形成した自動車電話用ガラスアンテナ装置1。



(2)

特開平8-213820

## 【特許請求の範囲】

【請求項1】自動車の窓ガラスに導体パターンを用いて形成した自動車電話用ガラスアンテナ装置において、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、前記給電点近傍から上方に延びる所定の長さの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、前記対称軸に対称の平面形状の放射用パターンと、所定の長さの2辺を有する矩形状の接地用パターンとを窓ガラス上に形成したことを特徴とする自動車電話用ガラスアンテナ装置。

【請求項2】前記任意形状の線分を前記所定の長さの線分を半径とする弧で形成し、前記放射用パターンを扇形状としたことを特徴とする請求項1記載の自動車電話用ガラスアンテナ装置。

【請求項3】前記任意形状の線分を直線で形成し、前記放射用パターンを二等辺三角形状としたことを特徴とする請求項1記載の自動車電話用ガラスアンテナ装置。

【請求項4】前記任意形状の線分を折れ線で形成し、前記放射用パターンを前記対称軸に対称の多角形状としたことを特徴とする請求項1記載の自動車電話用ガラスアンテナ装置。

【請求項5】前記扇形状、二等辺三角形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、前記放射用パターンを形成したことを特徴とする請求項2、請求項3、および請求項4記載の自動車電話用ガラスアンテナ装置。

【請求項6】前記放射用パターンの給電点と、前記接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備えたことを特徴とする請求項1、請求項2、請求項3、請求項4、および請求項5記載の自動車電話用ガラスアンテナ装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】この発明は自動車の窓ガラスに形成されてUHF帯域で送受信を行なう自動車電話用ガラスアンテナ装置に係り、特に800MHzと1.5GHzの周波数帯域において、1つのアンテナで良好な感度が得られる自動車電話用ガラスアンテナ装置に関する。

## 【0002】

【従来の技術】本出願人が実開平5-82113号公報で開示したように、従来の自動車電話用ガラスアンテナ装置は、放射用パターンがモノポール形状で接地用パターンが矩形状の導体パターンで構成されている。

【0003】図9に従来の自動車電話用ガラスアンテナ装置の構成図を示す。図9において、自動車電話用ガラスアンテナ装置50は、窓ガラス51上に、上下方向の長さが約1/4波長の放射用パターン52と、上下方向の長さが約1/4波長で左右方向の長さが約1/4~3/4波長の接地用パターン53とで形成される。放射用

パターン52の給電点Aには、同軸ケーブル54(特性インピーダンス50Ω)の芯線54aが接続され、接地用パターン53の接地点Bには、同軸ケーブル54の外側導体54bが接続される。このように構成された放射用パターン52がモノポール形状の自動車電話用ガラスアンテナ装置50は、送受信周波数が800MHz帯域の自動車電話装置のアンテナとして使用される。

【0004】図10は従来の自動車電話用ガラスアンテナ装置の指向特性図である。図10において、800MHz帯域において測定した周波数900MHzでの指向特性は全方向でほぼ均一な値を示し、感度差はみられない。

## 【0005】

【発明が解決しようとする課題】自動車電話装置の普及につれて送受信周波数も800MHz帯域に加えて1.5GHz帯域も利用されるようになってきているが、放射用パターンがモノポール形状の従来の自動車電話用ガラスアンテナ装置を1.5GHzの周波数帯域で適用すると、図10に示すように、1.5GHzの周波数では指向特性にばらつきがあり充分な感度が得られない。

【0006】1.5GHzの周波数帯域で良好な感度指向特性を得るには、1.5GHz帯域用のモノポール形状の自動車電話用ガラスアンテナ装置が、別に必要になる。800MHzと1.5GHzの周波数帯域の電波を良好に送信または受信しようとすると、ガラスアンテナの数は送受信装置に接続する同軸ケーブルの数と同数の2組が必要になる。このように、800MHzと1.5GHzの周波数帯域用のモノポール形状の自動車電話用ガラスアンテナ装置を自動車の窓ガラス上に形成しようとすると、広い実装スペースが要求され、アンテナの小型化が図れず、かつ製造が複雑になる課題がある。そのため、800MHzと1.5GHzの周波数帯域でも良好な感度指向特性を有する自動車電話用ガラスアンテナ装置が望まれている。

【0007】この発明はこのような課題を解決するためなされたもので、その目的は800MHzと1.5GHzの2つの周波数帯域の電波を良好に受信できる自動車電話用ガラスアンテナ装置を提供することにある。

## 【0008】

【課題を解決するための手段】前記課題を解決するためこの発明に係る自動車電話用ガラスアンテナ装置は、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、給電点近傍から上方に延びる所定の長さの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、対称軸に対称の平面形状の放射用パターンと、所定の長さの2辺を有する矩形状の接地用パターンとを窓ガラス上に形成したことを特徴とする。

【0009】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を所定の長さの線分を

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半径とする弧で形成し、放射用パターンを扇形状としたことを特徴とする。

【0010】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を直線で形成し、放射用パターンを二等辺三角形状としたことを特徴とする。

【0011】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を折れ線で形成し、放射用パターンを対称軸に対称の多角形状としたことを特徴とする。

【0012】また、この発明に係る自動車電話用ガラスアンテナ装置は、扇形状、二等辺三角形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、放射用パターンを形成したことを特徴とする。

【0013】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、放射用パターンの給電点と接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備えたことを特徴とする。

【0014】

【作用】この発明に係る自動車電話用ガラスアンテナ装置は、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、給電点近傍から上方に延びる所定の長さの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、対称軸に対称の平面形状の放射用パターンと、所定の長さの2辺を有する矩形状の接地用パターンとを窓ガラス上に形成したので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0015】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を所定の長さの線分を半径とする弧で形成し、放射用パターンを扇形状としたので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0016】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を直線で形成し、放射用パターンを二等辺三角形状としたので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0017】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を折れ線で形成し、放射用パターンを対称軸に対称の多角形状としたので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0018】また、この発明に係る自動車電話用ガラスアンテナ装置は、扇形状、二等辺三角形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、放射用パターンを形成したので、1つの自動車電

話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0019】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、放射用パターンの給電点と接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備えたので、放射用パターンの給電点と接地用パターンの接地点に接続される同軸ケーブルとインピーダンスの整合ができ、周波数帯域全体に亘り感度を高めることができる。

10 【0020】

【実施例】以下、この発明の実施例を添付図面に基づいて説明する。図1はこの発明に係る自動車電話用ガラスアンテナ装置の構成図である。図1において、自動車電話用ガラスアンテナ装置1は、所定の半径Rと角度θを有する扇形状の放射用パターン3と、所定の長さの2辺を有する矩形状の接地用パターン4とを、距離Dで窓ガラス2上に形成する。また、放射用パターン3の給電点Aに、同軸ケーブル5（特性インピーダンス50Ω）の芯線5aを接続し、接地用パターン4の接地点Bに、同軸ケーブル5の外側導体5bを接続する。

【0021】扇形状の放射用パターン3の半径Rと角度θの値により、ガラスアンテナ装置のインピーダンスや周波数帯域を設定する。ガラスアンテナのインピーダンスを略50Ωに設定する場合は、Rとθの値は次の範囲（30mm < R < 60mm、80° < θ < 140°）が望ましい。また、放射用パターン3と接地用パターン4の距離Dの値は次の範囲（2mm < D < 10mm）が望ましい。

30 【0022】以下に説明する諸特性は、扇形状の放射用パターン3の半径Rを45mm、角度θを120°、矩形状の接地用パターン4の上下方向の長さHを40mm、左右方向の長さLを60mm、放射用パターン3と接地用パターン4の距離Dを5mm、同軸ケーブル5（特性インピーダンス50Ω）の長さを2mに設定し、自動車電話用ガラスアンテナ装置1が自動車の前面または背面の傾斜した窓ガラス2に設けられることを想定し、水平に配置された銅板上に30°の傾斜角度で設置して測定した。

【0023】図2はこの発明に係る自動車電話用ガラスアンテナ装置の指向特性図である。図2において、900MHzと1.5GHzで測定した場合の特性であり、周波数で全方向ほぼ均一な値を示し、良好な指向特性が得られる。

【0024】図3はこの発明に係る自動車電話用ガラスアンテナ装置の800MHz帯域における感度周波数特性図である。図3において、本発明の自動車電話用ガラスアンテナ装置は、従来の自動車電話用ガラスアンテナ装置に比較して、周波数帯域全体でわずかに平均感度が低下しているが実用上支障のないレベルである。

50 【0025】図4はこの発明に係る自動車電話用ガラス

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アンテナ装置の1.5GHz帯域における感度周波数特性図である。図4において、本発明の自動車電話用ガラスアンテナ装置は従来の自動車電話用ガラスアンテナ装置に比較して周波数帯域全体に亘り平均感度が高く、図3に示す800MHz帯域の平均感度とほぼ同等なレベルである。

【0026】図5はこの発明に係る自動車電話用ガラスアンテナ装置の800MHz帯における電圧定在波比周波数特性図である。電圧定在波比はその値が小さいほど、アンテナと同軸ケーブルのインピーダンスの整合がとれることを示す。図5において、本発明の自動車電話用ガラスアンテナ装置は従来の自動車電話用ガラスアンテナ装置に比較し、周波数帯域全体に亘りほぼ同等の値を示す。

【0027】図6はこの発明に係る自動車電話用ガラスアンテナ装置の1.5GHz帯における電圧定在波比周波数特性図である。図6において、本発明の自動車電話用ガラスアンテナ装置は、数値が小さく、アンテナと同軸ケーブルとのインピーダンスの整合がとれている。

【0028】図7はこの発明に係る自動車電話用ガラスアンテナ装置の別実施例構成図である。図7において、自動車電話用ガラスアンテナ装置6は放射用パターーン3の給電点Aと接地用パターーン4の接地点Bの近傍に導体パターーンで形成したインピーダンス調整手段7を備える点が、図1の自動車電話用ガラスアンテナ装置と異なる。インピーダンス調整手段7を備えることにより、放射用パターーン3の給電点Aと接地点Bに接続された同軸ケーブル5とのインピーダンスの整合をとり、周波数帯域全体に亘り感度を高めることができる。

【0029】図8はこの発明に係る自動車電話用ガラスアンテナ装置のさらに別実施例構成図である。図8(a)に示すように、自動車電話用ガラスアンテナ装置8は、二等辺三角形状の放射用パターーン9と矩形状の接地用パターーン4で構成しても良い。また、図8(b)に示すように、自動車電話用ガラスアンテナ装置10は、扇形部を中心抜きにした放射用パターーン11と矩形部を中心抜きにした接地用パターーンで構成しても良い。

【0030】なお、放射用パターーンは、図1に示す扇形状の放射用パターーン3の角度θを120°とし、半径Rの2辺と扇形の弧上的一点とで菱形状に形成しても良い。

【0031】

【発明の効果】以上説明したように、この発明に係る自動車電話用ガラスアンテナ装置は、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、給電点近傍から上方に延びる所定の長さの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成して対称軸に対称の平面形状の放射用パターーンと、所定の長さの2辺を有する矩形状の接地用

パターーンとを窓ガラス上に形成し、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0032】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を所定の長さの線分を半径とする弧で形成して放射用パターーンを扇形状とし、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0033】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を直線で形成して放射用パターーンを二等辺三角形状とし、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0034】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を折れ線で形成して放射用パターーンを対称軸に対称の多角形状とし、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0035】また、この発明に係る自動車電話用ガラスアンテナ装置は、扇形状、二等辺三角形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターーンで、放射用パターーンを形成し、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0036】また、この発明に係る自動車電話用ガラスアンテナ装置は、放射用パターーンの給電点と、接地用パターーンの接地点近傍に導体パターーンで形成したインピーダンス調整手段を備え、給電点と接地点に接続された同軸ケーブルと整合するので、周波数帯域全体に亘り高感度を実現することができる。

【0037】よって、800MHzと1.5GHzの2つの周波数帯域の電波を良好に受信する小形で高感度の自動車電話用ガラスアンテナ装置を提供することができる。

【図面の簡単な説明】

【図1】この発明に係る自動車電話用ガラスアンテナ装置の構成図

【図2】この発明に係る自動車電話用ガラスアンテナ装置の指向特性図

【図3】この発明に係る自動車電話用ガラスアンテナ装

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## 置の800MHz帯域における感度周波数特性図

【図4】この発明に係る自動車電話用ガラスアンテナ装置の1.5GHz帯域における感度周波数特性図

【図5】この発明に係る自動車電話用ガラスアンテナ装置の800MHz帯域における電圧定在波比周波数特性図

【図6】この発明に係る自動車電話用ガラスアンテナ装置の1.5GHz帯域における電圧定在波比周波数特性図

【図7】この発明に係る自動車電話用ガラスアンテナ装置の別実施例構成図

【図8】この発明に係る自動車電話用ガラスアンテナ装

## 置のさらに別実施例構成図

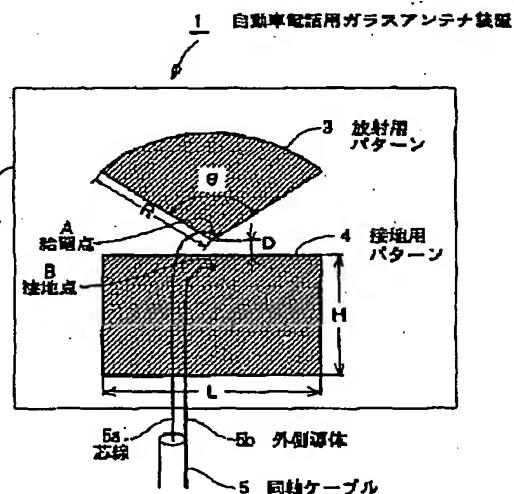
【図9】従来の自動車電話用ガラスアンテナ装置の構成図

【図10】従来の自動車電話用ガラスアンテナ装置の指向特性図

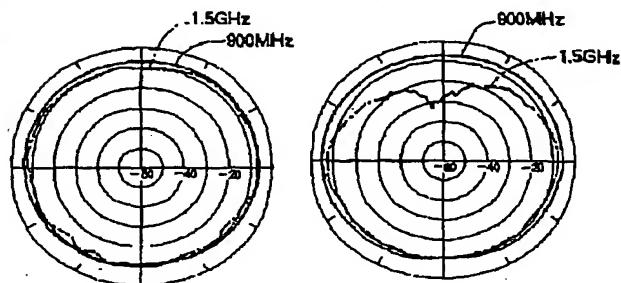
## 【符号の説明】

- 1, 6, 8, 10…自動車電話用ガラスアンテナ装置、  
 3, 9, 11, 52…放射用パターん、7…インピーダンス調整手段、4, 12, 53…接地用パターん、5, 10 54…同軸ケーブル、2, 51…窓ガラス、50…従来の自動車電話用ガラスアンテナ装置。

【図1】

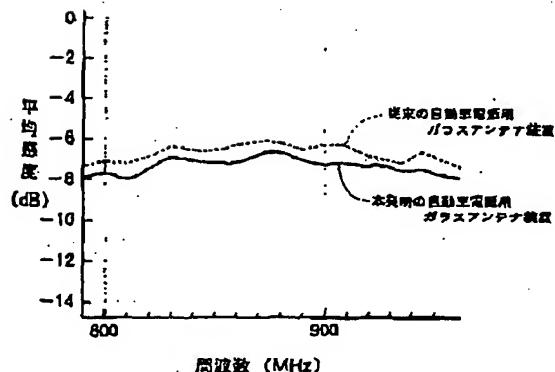


【図2】

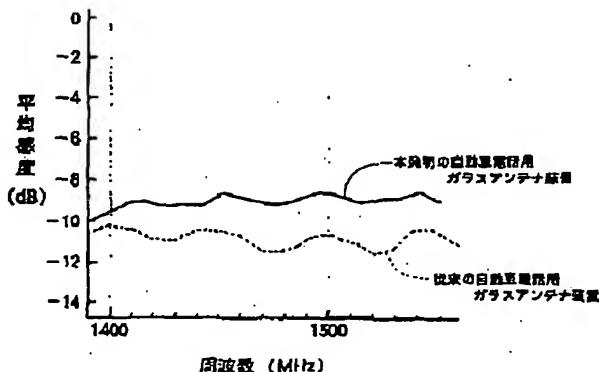


【図10】

【図3】



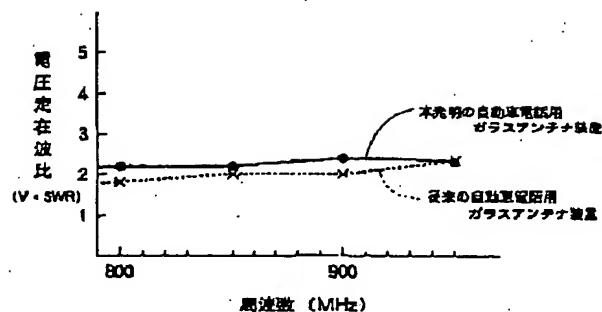
【図4】



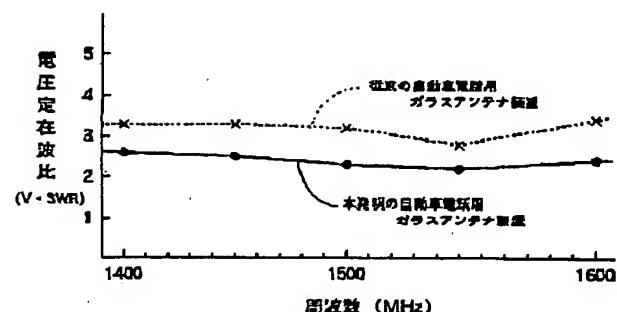
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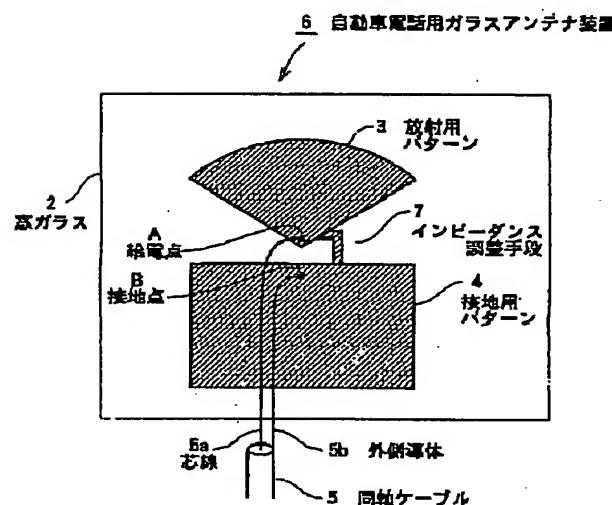
【図5】



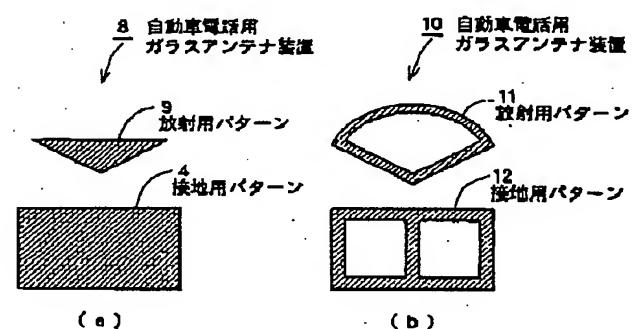
【図6】



【図7】



【図8】



【図9】

